THE FOOD OF TROUT IN WESTERN AUSTRALIA

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The sueeessful acclimatisation of trout in the various river systems of South-western Australia depends largely upon the presence of a suitable food supply. No detailed study has been made of the food of trout in our streams but the stomach contents of a number of speeimens have been analysed and the information revealed is eonsidered to be of suffieient interest to form the subject of a brief diseussion.

Owing to the small number of trout examined and the variety of localities from which they have been obtained, it is considered desirable to itemise the stomach eontents of each speeimen.

1. Pemberton (Treen Brook), 1941. Rainbow Trout, female, weight 5¼ lb.

Very small fish bones, 2; erustaeean appendages *(Cheraps* sp.); trout egg?, 1; several leaves and algal strands; unidentifiable maeerated material.

2. Pemberton (Treen Brook), 1941. Rainbow Trout, weight 5 lb.

Crustaeean appendages *(Cheraps* sp.); maeerated erustaeean flesh.

3. Pemberton (Big Brook), 1941. Brown Trout, weight 3 lb. 12 oz.

Crustaeean appendages *(Cheraps* sp.) and maeerated material.

4. Pemberton (Big Brook), 1948. sp.?

Syrphidae, 1; Diptera, 1; Dytiseidae, 1; Cureulionidae, 1; Scarabeidae, 1; small Crustaeea *(Cheraps* sp.), 2.

5. Lower Donnelly River, June 11, 1943. Rainbow Trout, weight 9 oz. (netted).

Formieidae (winged), 225; small spider, 1; Chironomid pupal skins, 2; Corixidae, 3; Psammoeharidae, 1.

6. Yanehep, July 11, 1946. Rainbow Trout, male, length 35.5 cm.

Crustaeea *(Cheraps* sp.) (maeerated remains), 2; Carabidae, 1 (1 in. long); Dytiseidae, 1 (1 in. long); small twig, 1 aeaeia leaf and pieces of eharcoal ½ in. long.

7. Serpentine River, November 1949. Rainbow Trout?

Crustaeean remains *(Cheraps* sp.); Formicidae (winged), 36; Diptera, 48*; Coleoptera, 6; unidentifiable inseet remains.

8. Serpentine River, November 1949. Rainbow Trout?

Crustaeean remains *(Cheraps* sp.), 1; Formieidae (winged), 7; Diptera, 7*; Coleoptera, 2.

9. Bridgetown (Blackwood River), November 1950. Rainbow Trout.

Orthoptera (nymph), 1; Dermaptera, 1; Dytiseidae, 40; Gyrinidae, 3; Tenebrionidae, 4; Scarabaeidae, 2; Cerambyeidae, 1;

* Terrestrial?

Chrysomelidae, 2; Curculionidae, 2; Hymenoptera sp., 3; Formicidae (winged), 550; Muscidae, 2; Arachnida, 1.

10. Bridgetown (Blackwood River), November 1950. Rainbow Trout?

Pentatomidae, 3; Reduviidae, 1; Jassidae, 1; Elateridae, 14; Dytiscidae, 3; Gyrinidae, 1; Cerambycidae, 1; Chrysomelidae, 3; Tenebrionidae, 2; Carabidae, 3; Scarabacidae, 5; Buprestidae, 5; Curculionidae, 1; Coleoptera sp., 1; Formicidae (winged), 114; Ichneumonidae, 4; Scoliidae, 1; Psammocharidae, 2; Thynnidae, 1; Apoidea, 3; Hymenoptera sp., 12; Lepidopterous larva, 1; charcoal and macerated insect remains.

The most casual study of the information just listed will show that Crustacea (occurring in 7 out of 10 stomachs examined) are quite an important item of food for local trout and that aquatic insects are very poorly represented in the diet.

A detailed analysis of how the various food items are represented is hardly warranted in such an inadequate sample but the following summary will give some indication of the importance of the various food groups and the relative abundance of aquatic and terrestrial forms.

INSECT REPRESENTATIVES IN THE DIET OF TROUT.

Localities: Blackwood River, Serpentine River, Yanchep, Big Brook (Pemberton), Lower Donnelly River, Treen Brook (Pemberton).

Insect Orders	Numbers of individuals.	Percentage of total.	Aquatic representatives.	Terrestrial representatives.
Order Coleoptera	104	9.4	51	53
„ Dermaptera	1	0.1	1	—
„ Diptera	53	4.8	2	51
„ Hemiptera	8	0.7	3	5
„ Hymenoptera ...	939	84.8	—	939
„ Lepidoptera	1	0.1	—	1
„ Orthoptera	1	0.1	—	1
Totals	1107	100.0	57	1050

$$\frac{\text{Aquatic}}{\text{Terrestrial}} = \frac{57}{1050} = 1{:}18 \text{ approximately.}$$

In addition to the insects, remains were also identified of the following organisms:—

Crustacea (*Cheraps* sp.?)—mostly appendages and macerated tissue making up a considerable proportion of the stomach contents of those trout from the Pemberton district.

Arachnids—2 small spiders.

Chordata—bones of fish; trout egg?

Plant material—leaves; algae; charcoal.

The complete absence of Caddis flies (Trichoptera) or May flies (Ephemeroptera) from the stomachs examined and the scarcity of other aquatic insects, emphasises the difference between the food supply available in local rivers and in the typical trout streams of the Eastern States and overseas.

Butcher (1945) shows that trout in Victoria feed on a preponderance of aquatic food, and Percival (1932) has shown the same thing for the New Zealand fish.

A brief survey of Pemberton streams made with Professor E. Percival in March, 1952 revealed a great lack of aquatic insect fauna and, although no systematic sampling was attempted, Professor Percival expressed the opinion that compared with New Zealand streams the Pemberton waters were particularly barren as regards aquatic insect life. This raises the question as to what is the future of trout acclimatisation in our South-west rivers. It would appear that the fish must rely upon crustaceans and drowned terrestrial insects for the bulk of their food. The hazardous existence which would be associated with any dependence upon the latter food source needs little emphasis. Termites, flying ants and grasshoppers often swarm in large numbers and at times may provide ample food, but for long periods they may be absent completely. Aquatic insects on the other hand would be almost constantly available either as adults or immature forms and a much more stable source of food would be provided. There is the distinct possibility that under present conditions the food supply in most of our streams is insufficient to maintain a trout population adequate for the needs of the angler. Should such prove to be the case, then the possibility of supplying sporting requirements by bulk releases of fish into various streams may need investigation.

Whether the introduction of different insect types would relieve the problem is very doubtful, but the wisdom of trying such introduction may be even more doubtful. Already the natural ecology of our streams has been upset by many introductions including that of the trout themselves and only after exhaustive investigations could attempts to establish different forms of insect life even be contemplated. The foregoing comments are based upon very superficial evidence and further investigations may reveal the erroneous nature of some of the deductions. The need for more extensive research, however, is clearly indicated and particularly would a biological survey of the south-west streams and a comprehensive examination of fish stomachs at all seasons of the year help to elucidate the problem of trout acclimatisation in South-western Australia.

Even before such a survey is taken the desirability of restricting trout or other fish releases to definite stream systems should be seriously considered. Once indiscriminate liberations have been made the clock cannot be turned back and the chance will be lost for ever of getting a true picture of virgin waters and the natural fauna which they normally support.

REFERENCES.

Butcher, A. D., 1945, "The Food of Indigenous and Non-Indigenous Fresh Water Fish in Victoria With Special Reference to Trout", Fisheries Pamphlet No. 2. Fisheries and Game Department, Victoria.

Percival, E., 1932, "On the Depreciation of Trout Fishing in the Oreti (or New River), Southland". New Zealand Mar. Dept., Fish. Bull. No. 5. pp. 1-48.